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IMPLEMENTATION PLAN REVIEW FOR MINNESOTA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

Environmental Protection Agency
Research Triangle Park, North Carolina

March 1975

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IMPLEMENTATION PLAN REVIEW

FOR

MINNESOTA

AS REQUIRED

BY

THE ENERGY SUPPLY

AND

ENVIRONMENTAL COORDINATION ACT

U. S. ENVIRONMENTAL PROTECTION AGENCY

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16. ABSTRACT

Section IV of the Energy Supply and Environmental Coordination Act of 1974, (ESECA) requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the national ambient air quality standards. This document, which is also required by Section IV of ESECA, is EPA's report to the State indicating where regulations might be revised.

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IMPLEMENTATION PLAN REVIEW

FOR

MINNESOTA

REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

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March 1975

MINNESOTA

ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT
SECTION IV - STATE IMPLEMENTATION PLAN REVIEW

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STATE IMPLEMENTATION PLAN REVIEW
FOR
THE STATE OF MINNESOTA

1.0 EXECUTIVE SUMMARY

The enclosed report is the U. S. Environmental Protection Agency's (EPA) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). In addition to requiring that EPA report to the state on whether control regulations might be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the states. The states may, as in the Clean Air Act of 1970, initiate State Implementation Plan revisions; ESECA does not, however, require states to change any existing plan.

Congress has intended that this report provide the state with information on excessively restrictive control regulations. The intent of ESECA is that wherever possible SIP's be revised in the interest of conserving low sulfur fuels or converting sources which burn oil or natural gas to coal. EPA's objective in carrying out the SIP reviews, therefore, has been to try to establish if emissions from combustion sources may be increased. Where an indication can be found that emissions from certain fuel burning sources can be increased and still attain and maintain NAAQS, it may be plausible that fuel resource allocations can be altered for "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallel EPA's policy on clean fuels. The Clean Fuels Policy has consisted of reviewing implementation plans with regards to saving low sulfur fuels and, where the primary sulfur dioxide air quality standards were not exceeded, to encourage states to either defer compliance with regulations or to revise the SO_2 emission regulations. The states have also been asked to discourage large scale shifts from coal to oil where this could be done without jeopardizing the attainment and maintenance of the NAAQS.

To date, EPA's fuels policy has addressed only those states with the largest clean fuels saving potential. Several of these states have or are currently in the process of revising SO_2 regulations. These states are generally in the Eastern half of the United States. ESECA, however, extends the analysis of potentially over-restrictive regulations to all 55 states and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

There are, in general, three predominant reasons for the existence of overly restrictive emission limitations within the State Implementation Plans. These are: 1) the use of the example region approach in developing statewide air quality control strategies; 2) the existence of State Air Quality Standards which are more stringent than NAAQS; and 3) the "hot spots" in only part of an Air Quality Control Region (AQCR) which have been used as the basis for controlling the entire region. Since each of these situations affect many state plans and in some instances conflict with current national energy concerns, a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal of the SIP's conducted in 1972. At that time SIP's were approved by EPA if they demonstrated the attainment of NAAQS or more stringent state air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a state to identify the most polluted air quality control region (AQCR) and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCR's of the state if the control regulations were applied to similar sources. The problem with the use of an example region is that it can result in excessive controls, especially in the utilization of clean fuels, for areas of the state where sources would not otherwise contribute to NAAQS violations. For example, a control strategy based on a particular region or source can result in a regulation requiring 1 percent sulfur oil to be burned statewide where the use of 3 percent sulfur coal would be adequate to attain NAAQS in some locations.

EPA anticipates that a number of states will use the review findings to assist them in deciding whether or not to revise portions of their State Implementation Plans. However, it is most important for those states which desire to submit a revised plan to recognize the review's limitations. The findings

of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent EPA's best judgment and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources were found, however, they were used in the analysis.

The data upon which the reports' findings are based is the most currently available to the federal government. However, EPA believes that the states possess the best information for developing revised plans. The states have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of quality air. Therefore, those states desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data supporting EPA's findings. In developing a suitable plan, it is suggested that states select control strategies which place emissions for fuel combustion sources into perspective with all sources of emissions such as smelters or other industrial processes. States are encouraged to consider the overall impact which the potential relaxation of overly restrictive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, NO_x, and HC emissions which occur in fuel switching, and other potential air pollution situations such as sulfates.

Although the enclosed analysis has attempted to address the attainment of all the NAAQS, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide (SO_2) emissions. This is because stationary fuel combustion sources constitute the greatest source of SO_2 emissions and are a major source of TSP emissions.

Part of each state's review was organized to provide an analysis of the SO_2 and TSP emission tolerances within each of the various AQCR's. The regional emission tolerance estimate is, in many cases, EPA's only measure of the "over-cleaning" accomplished by a SIP. The tolerance assessments have been combined with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for changing emission limitation regulations.

In conjunction with the regional analysis, a summary of the state's fuel combustion sources (power plants, industrial sources, and area sources) has also been carried out.

The following are the principle findings for the State of Minnesota. (Air Quality Control Regions are displayed in Fig. 1-1.)

- The state has adopted the Federal National Ambient Air Quality Standards for particulates and nitrogen dioxide but has adopted more stringent standards for SO_2. Attainment of the state SO_2 standards would require stricter emission controls than would attainment of the federal NAAQS only.
- The statewide regulations for particulates and SO_2 are based on the example region approach. Minnesota has not initiated any changes in the SO_2 regulations under EPA's Clean Fuels Policy.
- Within the framework of this review there appears to be little tolerance throughout the state for increased particulate emissions and hence for relaxation of particulate emissions regulations. This is based on high particulate readings (based on 1973 data) and several proposed Air Quality Maintenance Area designations. In Central Minnesota (#127), the only region for which high particulate levels are not being recorded, regulations are just barely being met and any particulate emission regulation relaxation may jeopardize attainment of NAAQS.
- For SO_2 there are indications of a substantial margin for increased SO_2 emissions in all regions except Minneapolis-St. Paul (#131). Despite the indications, Central Minnesota (#127), Metropolitan Fargo-Moorhead (#130), Northwest Minnesota (#132), and Southwest Minnesota (#133) are rated as having poor potential for SO_2 regulation relaxation. This conclusion is based on the fact that the majority of plants in the region are small and/or there is little potential for clean fuel savings. (It should be noted that for all regions except Minneapolis-St. Paul (#131), small plants ($\leq 250 \times 10^6$ Btu/hr heat input) are unregulated. Southeast Minnesota-La Crosse (#128) has some potential for clean fuel savings. Although the small plants are unregulated in this region, the large Fox Lake plant has been identified by the Federal Energy Administration

as having the potential to switch from oil to coal burning leading to some overall savings of low sulfur oil. Several large plants are present in the Duluth-Superior region (#129), but modeling should be performed before any conclusions are reached regarding clean fuel savings potential. Hence, the marginal rating for regulation revisions in this region.

- For Minneapolis-St. Paul (#131) some regulation relaxation might be possible despite the high SO_2 levels. This conclusion is based on the modeling results which indicate that the state's largest power plant, the A. S. King plant, has the potential of switching to high sulfur coal leading to a substantial savings of lower sulfur coal.

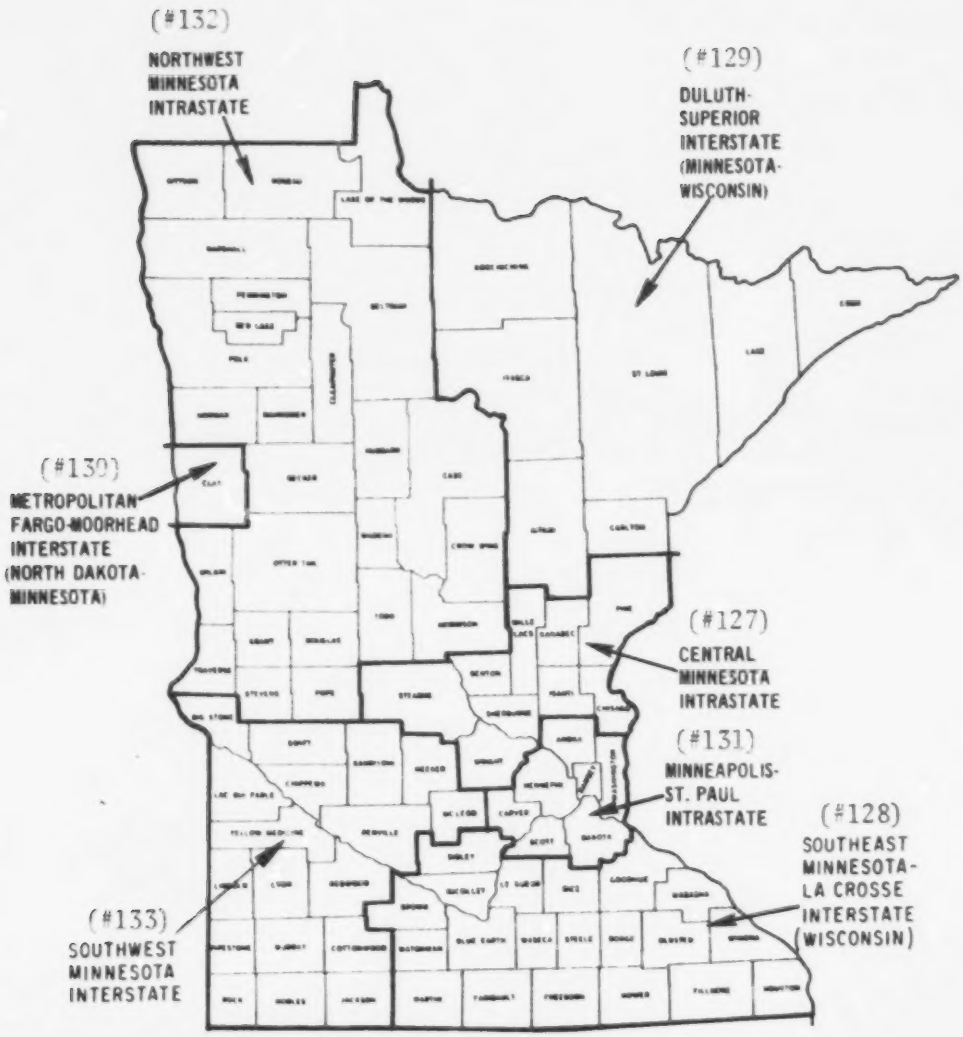

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Figure 1-1. Minnesota Air Quality Control Regions

2.0 MINNESOTA STATE IMPLEMENTATION PLAN REVIEW

2.1 Summary

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

- Does the state have air quality standards which are more stringent than NAAQS?
- Does the state have emission limitation regulations for control of (1) power plants, (2) industrial sources, (3) area sources?
- Did the state use an example region approach for demonstrating the attainment of NAAQS or more stringent state standards?
- Has the state not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?
- Are there no proposed Air Quality Maintenance Areas?
- Are there indications of a sufficient number of monitoring sites within a region?
- Is there an expected 1975 attainment date for NAAQS?
- Based on (1973) air quality data, are there indications of a tolerance for increasing emissions?
- Are the total emissions from stationary fuel combustion sources a relatively small portion of the regional total?
- Do modeling results for specific fuel combustion sources show a potential for a regulation revision?
- Is there a significant clean fuels savings potential in the region?
- Must the regulations be revised to accomplish significant fuels switching?

The following portion of this report is directed at answering these questions. An AQCR's potential for revising regulations increases when there are affirmative responses to the above.

The initial part of the SIP review report, Section 2 and Appendix A, is organized to provide the background and current situation information for the State Implementation Plan. Section 3, and the remaining Appendices provide an

AQCR analysis which helps establish the overall potential for revising regulations. An evaluation of regional air quality indicators is presented in Appendix B; power plants, industrial sources, and area sources are analyzed in Appendices C, D, and E, respectively.

Based on an overall evaluation of EPA's current information, AQCR's have been classified as good, marginal, or poor candidates for regulation revisions. Table 2-1 summarizes the State Implementation Plan Review. The remaining portions of the report support this summary with explanations.

2.2 Air Quality Setting for the State of Minnesota

2.2.1 Minnesota Air Pollution Control Areas

The State of Minnesota is divided into seven Air Quality Control Regions (AQCRs) as shown in Fig. 1-1: four intrastate and three interstate. Table A-1 gives the pollutant priority classifications for each of these regions. The table also shows population to be highest in Minneapolis-St. Paul (AQCR #131). A population center also exists in the City of Duluth in Duluth-Superior (AQCR #129). Based on present conditions and growth projections for the state, all seven counties in the Minneapolis-St. Paul AQCR (#131) have been proposed as Air Quality Maintenance Areas (AQMAs) for both particulates and SO_2. In addition, the City of Duluth in the Duluth-Superior AQCR (#129) has been proposed as a AQMA for particulates. These are indicated in Table A-1 and Fig. A-1.

2.2.2 Minnesota Ambient Air Quality Standards

As shown in Table A-2, Minnesota has adopted the federal primary and secondary National Ambient Air Quality Standards (NAAQS) for particulates and nitrogen dioxide. For sulfur oxides, Minnesota has adopted both primary and secondary standards which are more stringent than the federal standards. The following analysis will address attainment of the federal NAAQS only.

2.2.3 Minnesota Air Quality Status

The current air quality status in Minnesota is summarized in Table A-3 for particulates and Table A-4 for SO_2. The data is from the SAROAD data bank as of June, 1974.

TABLE 2-1. State Implementation Plan Review Summary for Minnesota

"INDICATORS"	State		Central Minnesota AQCR# 127		Southeast Minnesota-LaCrosse[a] AQCR# 128		Duluth-Superior[a] AQCR# 129		Metropolitan Fargo-Moorhead[a] AQCR# 130	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?	No	Yes								
• Does the State have emission limiting regulations for control of: 1. Power plants 2. Industrial sources 3. Area sources	Yes Yes Yes	Yes Yes Yes								
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	Yes	Yes					Example Region Priority I			
• Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?	Yes	Yes								
• Are there no proposed Air Quality Maintenance Areas?			Yes	Yes	Yes	Yes	No	Yes	No[b]	Yes
• Are there indications of a sufficient number of monitoring sites within a region?			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Is there an expected 1975 attainment date for NAAQS?			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Based on (1973) Air Quality Data, are there no reported violations of NAAQS?			Yes	Yes	No	Yes	No	Yes	No	Yes
• Based on (1973) Air Quality Data, are there indications of a significant tolerance for increasing emissions?			No	Yes	No	Yes	No	Yes	No	Yes
• Are the emissions from stationary fuel combustion sources a relatively small portion of the regional total?			No	No	Yes	Yes	No	No	Yes	No
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?			N.A.	N.A.	N.A.	No	N.A.	No[d]	N.A.	N.A.
• Is there a significant Clean Fuels Saving potential in the region?			No		Yes[c]		No[d]		No	
• Must the regulations be revised to accomplish significant fuel switching?			No		Yes		No		No	
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations? [f]			TSP - Poor SO_2 - Poor		TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Marginal[d]		TSP - Poor SO_2 - Poor	

TABLE 2-1. State Implementation Plan Review Summary for Minnesota (Contd.)

"INDICATING"	Minneapolis-St. Paul AQCR# 131		Northwest Minnesota AQCR# 132		Southwest Minnesota AQCR# 133					
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?										
• Does the State have emission limiting regulations for control of: 1. Power plants 2. Industrial sources 3. Area sources										
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	Example Region Priority I									
• Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?										
• Are there no proposed Air Quality Maintenance Areas?	No	No	Yes	Yes	Yes	Yes				
• Are there indications of a sufficient number of monitoring sites within a region?	Yes	Yes	Yes	No	Yes	No				
• Is there an expected 1975 attainment date for NAAQS?	Yes	Yes	Yes	Yes	Yes	Yes				
• Based on (1973) Air Quality Data, are there no reported violations of NAAQS?	No	No	No	Yes	No	Yes				
• Based on (1973) Air Quality Data, are there indications of a significant tolerance for increasing emissions?	No	No	No	Yes	No	Yes				
• Are the emissions from stationary fuel combustion sources a relatively small portion of the regional total?	No	No	No	No	No	No				
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?	N.A.	Yes	N.A.	N.A.	N.A.	N.A.				
• Is there a significant Clean Fuels Saving potential in the region?	Yes		No		No					
• Must the regulations be revised to accomplish significant fuel switching?	Yes		No		No					
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?	TSP - Poor SO_2 - Marginal		TSP - Poor SO_2 - Poor		TSP - Poor SO_2 - Poor					

TABLE 2-1. State Implementation Plan Review Summary for Minnesota (contd.)

Footnotes

[a] Interstate

[b] There is a proposed AQMA in the North Dakota portion of the region.

[c] Based on the fact that the Fox Lake plant has been identified by the F.E.A. as having the potential for switching from oil to coal.

[d] The Clay Boswell power plant, which will have the second highest capacity in the state by 1975, has not been modeled and is presently using low sulfur fuel. Modeling would be required to determine if high sulfur fuel is useable.

[e] The marginal rating for revising SO_2 regulations is given since modeling results indicated that only the A. S. King power plant (the state's largest plant) has the potential for switching to high sulfur coal.

[f] Good - Air quality indicators show a tolerance to absorb increased emissions and source-by-source evaluations show a significant clean fuels saving potential.

Poor - Air quality indicators show little or no tolerance to absorb increased emissions and/or source evaluations indicate little or no clean fuels saving potential.

Marginal - Air quality and clean fuels savings evaluations are inconclusive or conflicting. More detailed analysis needed.

Based on the data in Table A-3, only Central Minnesota (#127) is not showing violations of the particulate standards. Indications are that severest problems are in Minneapolis-St. Paul (#131), Metropolitan Fargo-Moorhead (#130), and Duluth-Superior (#129). Particulate AQMAs have been proposed for all seven counties in the Minneapolis-St. Paul AQCR (#131), for the City of Duluth in the Duluth-Superior AQCR (#129), and in one county in the North Dakota portion of the Fargo-Moorhead AQCR (#130). These proposals are consistent with the measured air quality for the three regions. Overall, the indications are that there is little room for particulate regulation relaxation in Minnesota.

Only Minneapolis-St. Paul (#131) is presently reporting violations of SO_2 ambient standards and is thus the only region, for which data exists, that does not indicate some tolerance for increased SO_2 emissions based on regional air quality. However, the SO_2 emissions data available from both Northwest Minnesota (#132) and Southwest Minnesota (#133) is based in each case on only one 24-hour monitoring station. All seven counties in the Minneapolis-St. Paul AQCR (#131) have been proposed as AQMAs for SO_2. This proposal is consistent with the measured SO_2 levels for this region. Hence, except for Minneapolis-St. Paul (#131), the other six AQCRs show an apparent ability to absorb increases in SO_2 emissions. Care must be exercised, however, because of the paucity of monitoring stations in Northwest (#132) and Southwest (#133) Minnesota. Overall, this is encouraging from the perspective of clean fuels conservation.

2.2.4 Minnesota Emissions Summary

Emission sources and emission rates are tabulated in Tables A-5 to A-8. Indications are that all of the regions with the exception of Central Minnesota (#127) require reductions in particulate emissions in order to meet NAAQS. The implication is that any particulate relaxation for fuel combustion sources in areas other than Central Minnesota (#127) should be accompanied by a corresponding regulation tightening on other sources in order to achieve the necessary reduction in emissions. Caution must be exercised in regard to particulate relaxation even in Central Minnesota (#127), since this region is just barely meeting NAAQS according to the data in Table A-8.

Minnesota fuel combustion sources account for less than 40% of the particulate emissions in the seven AQCR area according to the data in Table A-5.

In Central Minnesota (#127) and Southeast Minnesota-La Crosse (#128), Minnesota fuel combustion sources contribute more than half of the particulate emissions. Minnesota electricity generation contributes substantially more particulate matter than either Minnesota industrial/commercial/institutional point sources or Minnesota area sources in only Minneapolis-St. Paul (#131) and Southwest Minnesota (#133). Minnesota industrial/commercial/institutional point sources are the largest Minnesota contributors in Metropolitan Fargo-Moorhead (#130) and Northwest Minnesota (#132). Minnesota area sources are proportionally the largest Minnesota particulate sources in Central Minnesota (#127) and Southeast Minnesota-La Crosse (#128). Minnesota electricity generation and industrial/commercial/institutional point sources are roughly equivalent and greater Minnesota contributors to particulate emissions than Minnesota area sources in Duluth-Superior (#129).

Most (70%) of the SO_2 emitted in the seven AQCRs comes from Minnesota fuel combustion sources. Only in Minneapolis-St. Paul (#131) does a major portion of the Minnesota SO_2 emissions come from electricity generation. In Central Minnesota (#127), Southeast Minnesota-La Crosse (#128), Metropolitan Fargo-Moorhead (#130), Northwest Minnesota (#132), and Southwest Minnesota (#133), the major Minnesota contributors to SO_2 emissions are the Minnesota area sources. A major portion of the Minnesota SO_2 emissions comes from Minnesota industrial/commercial/institutional point sources only in Duluth-Superior (#129). The rollback calculations displayed in Table A-8, indicate that all regions, except Minneapolis - St. Paul (#131) can tolerate SO_2 emission increases. In five of the AQCRs - Central Minnesota (#127), Duluth-Superior (#129), Minneapolis-St. Paul (#131), Northwest Minnesota (#132) and Southwest Minnesota (#133) - Minnesota fuel combustion sources make up no less than 80% of the SO_2 emissions (Table A-5). In these regions in particular any SO_2 emissions regulation relaxation should proceed cautiously to avoid jeopardizing NAAQS maintenance. In Southeast Minnesota-LaCrosse (#128), Minnesota fuel combustion sources make up less than 30% of the SO_2 emissions. In this region, any relaxation of regulations for Minnesota fuel combustion sources should be coordinated with revisions in the regulations in Wisconsin. Also, although Minnesota fuel combustion contribute 67% of the SO_2 emissions in Metropolitan Fargo-Moorhead (#130), any regulation relaxation should be coordinated with North Dakota regulation revisions since one county in the North Dakota portion of this region has been proposed as an AQMA.

2.3 Background on the Development of the Current State Implementation Plan

2.3.1 General Information

For Minnesota, two methods were used to relate emissions to air quality. The first was the use of the Air Quality Display Model (AQDM). The second was the use of the proportional model (rollback), described in the Federal Register Guidelines.

The AQDM uses annual emission data and annualized meteorological data to determine annual means of pollutant concentrations through a computer program. The AQDM was developed for use with particulate and sulfur dioxide air pollutants. It is generally applied to Priority I Regions. The Minneapolis-St. Paul AQCR (#131) is Priority I for these two pollutants. The AQDM was used to test strategies for sulfur dioxide and particulate air pollutants in the Minneapolis-St. Paul AQCR (#131).

The control plan must apply to the entire state. It was, therefore, desirable to include more than just one region in the analysis. The Duluth-Superior AQCR (#129) was chosen for further tests. It is classified Priority I for particulates. The Duluth emission inventory was not gridded for use by the AQDM. Therefore, testing for particulates was done by use of the proportional model.

2.3.2 Particulate Control Strategy

For development of a control strategy to attain and maintain the ambient air quality standards for particulates, the AQDM was first calibrated. Two strategies were decided upon for testing in the AQDM. The first strategy involved the application of existing particulate emission regulations to all emissions listed in the 1970 Inventory. These re-calculated emissions were then tested in the AQDM. Net growth of existing particulate emission levels within the Minneapolis-St. Paul AQCR (#131) during the period of 1970 to 1975 was calculated to be negligible due to the fact of over-control of many major sources under recently accepted compliance schedules.

The second strategy involved the application of federally proposed particulate emission regulations to all emissions listed in the 1970 inventory. The calculated emissions were then tested in the AQDM.

Results of the two strategy tests on an annual basis supported the need to retain the existing particulate emission limitations. The region was then examined for acceptable air quality under the 24-hour ambient air quality standards. Again, the proportional model was employed and the strategy test was based around the second highest station reading as called for by the ambient air standard. The percent reduction in emissions calculated was required by the strategy to assure attainment and maintenance of the primary 24-hour ambient air standard. Such a percent reduction in emissions between 1970 and 1975 is expected through the application of existing particulate emission limitations.

The Duluth-Superior AQCR (#129) was not gridded, and the AQDM could, therefore, not be applied to this region. The region is classified Priority I for particulates. The proportional model was used to test the rollback. Based on the calculations, it is expected that even the secondary standards for particulates can be achieved in Duluth through the application of existing regulations concerning particulates.

2.3.3 Sulfur Dioxide Control Strategy

For development of a strategy to attain the ambient air standard for SO_2, a sulfur regulation was considered. It was decided to test the AQDM using an allowable sulfur content in fossil fuels of 2 percent by weight. Existing SO_2 emissions shown in the emission inventory were recalculated to reflect such a fuel limitation. Expected growth in SO_2 emissions during the period extending from 1970 to 1975 was negligible and, therefore, did not affect the AQDM test. This recalculated data was then tested in the AQDM.

The maximum expected annual concentration achieved through the application of such a strategy is approximately 63 $\mu g/m^3$. The primary annual ambient air standard is 80 $\mu g/m^3$ and the secondary annual ambient air standard is 60 $\mu g/m^3$. The latter was based on the original federal secondary standard which has since been rescinded.

The strategy must also consider the primary 24-hour ambient air quality standard of 365 $\mu g/m^3$ and the secondary 24-hour ambient air standard of 260 $\mu g/m^3$. Existing 1970 air monitoring data revealed that the 24-hour standards had been exceeded at some stations. The proportional model was selected to further test the SO_2 strategy on a 24-hour basis. Since the maximum can be exceeded once per year, the second highest value of SO_2 concentration was

selected to look at the effect of higher-than-usual daily averages. A reduction calculation to achieve air quality standards was made. Based upon these calculations and the strategy considerations involving the 24-hour air quality standards, the proposed strategy appeared to be adequate to achieve the 24-hour primary standard.

2.4 Special Consideration for the State of Minnesota

2.4.1 Planned SIP Revisions

Minnesota is presently not considering changing its State Implementation Plan with respect to fuel combustion sources.

2.4.2 Fuels

Minnesota is a heavy user of coal. For example, in 1971, 67% of the statewide heat input for power plants from fossil fuels was derived from coal, 2% was derived from oil, and 31% was derived from gas.[6] Minnesota does not produce any coal and there are no reserves of coal located within this state. However, lignite is used by some power plants and industrial/commercial/institutional sources. Lignite is available in large quantities from nearby North Dakota.

2.4.3 Fuel Conversions

The Federal Energy Administration (FEA) has identified the Fox Lake Power Plant in Southeast Minnesota-La Crosse (#128) as a plant in Minnesota having the potential to convert from burning oil to coal.[7]

3.0 AIR QUALITY CONTROL REGION ASSESSMENTS

3.1 General Methodology

The previous section having set the background for the State Implementation Plan and evaluated the current air quality situation, this section will review the available information for each AQCR to determine the feasibility of relaxing emission regulations in the interest of conserving clean fuels. Care must be taken in interpreting the results of this analysis and the following caveats must be kept in mind: (1) The analytical procedure is intended to provide a first approximation to the evaluation of potential regulation changes (e.g., rollback and single source modeling techniques were used). The state should conduct a more detailed analysis of the situation to confirm or dispute any of these findings prior to submitting SIP revisions. (2) In many instances the necessary data were unavailable or limited in scope. Where possible, best engineering estimates were used to fill in the gaps. Where better information is available, the state should use it in developing SIP revisions.

The analysis encompasses five distinct considerations for each AQCR. First, the current air quality situation is assessed to determine if the indicators point to the region's ability to tolerate an emission increase without violation of any NAAQS. Most of the data necessary for this review have already been presented in Section 2 and Tables B-1 and B-2 summarize the information for particulates and SO_2, respectively, in each AQCR. The assessment is made on the basis of 7 criteria: (1) current air quality violations, (2) expected NAAQS attainment dates, (3) proposed Air Quality Maintenance Area designations, (4) total emissions, (5) portion of emissions from the state's fuel combustion sources, (6) regional emission reduction required (based on rollback calculations), and (7) pollutant priority classification. Note that this evaluation is based strictly on air quality considerations. Determinations of whether regulation relaxation would, in fact, result in clean fuels savings will be made on a source-by-source evaluation.

The second consideration for each AQCR is the power plant assessment and this data is summarized in the tables in Appendix C. All existing and proposed plants are reviewed and the clean fuel requirement is determined. Where dispersion modeling data are available, the maximum allowable fuel sulfur content which would enable the plant to meet the NAAQS in its immediate

vicinity is estimated. For the purposes of this report, the SO_2 modeling data used[1] assumes the power plant fuel use pattern in 1975 will be the same as that existing in 1971 with the addition of fuel consumption for new units coming on-line. The choice of 1971 as the baseline year is based on the consideration that fuel switching to achieve SIP emission regulations did not begin nationwide until 1972; therefore 1971 represents consumption patterns which are not dictated by emission regulations but rather by the economics of fuel determined from the modeling, the 1971 fuel content is used as an upper bound. For particulate emissions, plants currently below required SIP emission levels are assumed to remain so. No particulate modeling results were available. Fuel use data[2,3] and emission data[4,5] are drawn from both published and unpublished sources.

The third consideration for each AQCR is the assessment of large industrial/commercial/institutional point sources and the summary data is presented in Appendix D. The procedure is effectively equivalent to that carried out for power plants. Emission and fuel use data were drawn from the National Emission Data System (NEDS) file.[5] No individual source modeling data were available.

The fourth consideration is area source assessments. The fuel use patterns and clean fuel requirements determined by existing regulations are computed for these sources using NEDS data.[5] The results are summarized in Appendix E.

The fifth consideration is a synthesis of the first four in that the fuel use requirements that are imposed on all sources in the region are totaled. Summary tables are in Appendix F.

At this point, an overall assessment of the potential for regulation revision and resulting clean fuel savings can be made. The findings for each AQCR have been summarized on Table 2-1 and in Section 1. An AQCR is determined to be a good candidate for emission limit regulation revision if the air quality indicators show that the region has a tolerance to absorb increased emissions <u>and</u> if the source-by-source evaluations show that significant clean fuels savings could be effected by such revision. If the air quality situation is such that no emission increase could be tolerated <u>and/or</u> if the source evaluations show little or no clean fuels

savings potential, then the region is classified as a poor candidate for regulation revision. If the air quality or the clean fuels savings evaluations are inconclusive or show conflicting information, then the region is assessed as a marginal candidate for regulation revision. A much more detailed analysis must be carried out by the state to resolve the situation.

3.2 Central Minnesota Intrastate AQCR (#127)

Although there are no reported high particulate levels, the indications are that a significant ability to absorb increased particulate emissions does not exist in this region (Tables A-3 and A-8). Any regulation relaxation would have a substantial impact upon air quality, since Minnesota fuel combustion sources emit a large portion of the particulates in this region (Table A-5). Hence, this region is a poor candidate for particulate regulation relaxation (Table 2-1).

The region is also a poor candidate for SO_2 regulation relaxation (Table 2-1) even though indications are that there is a significant ability to absorb increased SO_2 emissions (Tables A-4 and A-8). There are only two relatively small power plants which, along with the industrial/commercial/institutional sources are unregulated. Hence, present regulations already allow the utilization of high sulfur fuels for these smaller plants.

3.3 Southeast Minnesota - LaCrosse Interstate AQCR (#128)

Based on a sufficient number of monitoring sites, there are indications of high particulate levels and hence no tolerance for increased emissions (Tables A-3 and A-8). Hence, the region is a poor candidate for relaxing particulate emission regulations.

Despite the indications from air quality that there is significant ability to absorb increased SO_2 emissions, the region is only a marginal candidate for SO_2 emission regulation relaxation (Tables A-4 and A-8).

The many smaller power plants and industrial/commercial/institutional sources ($\leq 250 \times 10^6$ BTU/hr) are unregulated and hence regulation relaxation would be unnecessary for these plants. The marginal rating is given, however, because the largest power plant in the region (Fox Lake) has been identified by the F.E.A. as having the potential for switching from oil to coal. Since this plant is presently using large amounts of oil (Table C-1),

a significant clean fuel savings is a possibility. Although modeling results are available for several power plants including the Fox Lake plant, the results are only for coal use and hence, particularly for the Fox Lake plant, do not look at total fuel use.

3.4 Duluth-Superior Interstate AQCR (#129)

This region is a poor candidate for particulate emission regulation relaxation. Air quality data from a large number of stations indicate high particulate levels (Tables A-3 and A-8). The proposal of an AQMA for the city of Duluth indicating expected difficulties with maintaining acceptable air quality reinforces this assessment (Table A-1).

Despite the indications from air quality that there is significant ability to absorb increased SO_2 emissions, the region is only a marginal candidate for SO_2 emission regulation relaxation. The modeling results listed in Table C-1 are merely an indication of the 1971 %S. The Clay Boswell power plant, which will have the second highest capacity in the state by 1975, has not actually been modeled and is presently using low sulfur fuel as are the Aurora and the Hibbard power plants. Modeling is necessary before a conclusion can be reached regarding the possibility of clean fuels savings, hence, the marginal rating.

3.5 Metropolitan Fargo-Moorhead Interstate AQCR (#130)

This region is a poor candidate for both particulate and SO_2 emission regulation relaxation. There are indications of high particulate levels (Tables A-3 and A-8) and there is a proposed particulate AQMA in the North Dakota portion of this region. In addition, there is little potential for clean fuel savings since there are no power plants (Table C-1) and only one significant industrial/commercial/institutional source (Table D-1) in the Minnesota portion of this region. Further, sources with heat input of less than 250×10^6 BTU/hr are unregulated; hence, regulation revisions would be unnecessary for clean fuel savings in the case of smaller plants and/or area sources.

3.6 Minneapolis - St. Paul Intrastate AQCR (#131)

This region is a poor candidate for particulate emission regulation relaxation. There are indications of widespread high particulate levels in this region (Tables A-3 and A-8). In addition, seven counties have

been proposed as AQMAs for particulates (Table A-1).

Air quality data indicates some high SO_2 levels in this region (Tables A-4 and A-8). In addition seven counties have been proposed as AQMAs for SO_2 (Table A-1). Despite this information, the region is given a marginal rating for revising SO_2 regulations. The rating is based on modeling results which indicate that the A.S. King power plant has the potential for switching to high sulfur coal (Table C-1). This would result in a significant clean fuel savings since the A.S. King plant is the largest capacity plant in the state (Table C-2 and F-1). However, any regulation revisions should proceed with extreme caution in order to avoid any worsening of the present air quality problems.

3.7 Northwest Minnesota Intrastate AQCR (#132)

This region is a poor candidate for particulate regulation relaxation because there are indications of high particulate levels in the region (Table A-3 and A-8).

The region is also considered to be a poor candidate for SO_2 emission regulation relaxation. Although the indications are that there is a significant ability to absorb increased SO_2 emissions (Tables A-4 and A-8), the data is based on only one monitoring station. No modeling has been performed for this region. The main reasons for the poor potential for regulation revisions are that small plants ($\leq 250 \times 10^6$ BTU/hr) are already unregulated and one of the main fuels being used in this region by both the power plants and the industrial/commercial/institutional sources is lignite which is probably locally available from North Dakota (Tables C-1 and D-1). Hence, there would be little reason to change existing regulations.

3.8 Southwest Minnesota Intrastate AQCR (#133)

There are indications of high particulate levels in this region (Tables A-3 and A-8) and sources in this region contribute a large portion of the emissions in this region (Table B-1). Hence, the region is a poor candidate for particulate emission regulation relaxation.

The region is also a poor candidate for SO_2 emission regulation relaxation despite the apparent indications of a significant ability to absorb increased SO_2 emissions (Table A-4 and A-8). This data, however,

is based on only one monitoring station. No modeling results are available for the region and there is little clean fuel savings potential in the region. Smaller plants ($\leq 250 \times 10^6$ BTU/hr) are already unregulated. The Minnesota Valley power plant is presently the only plant regulated in the region. It is using a rather small amount of low sulfur fuel and, hence, significant clean fuel savings would not be realized by changing regulations for this one plant.

APPENDIX A

State Implementation Plan Background

TABLE A-1. Minnesota Air Pollution Control Areas

Air Quality Control Region	Federal Number	Demographic Information			Priority Classification			Proposed AQMA Designations[a]	
		Population 1970 (Millions)	Area (Square Miles)	Population Per Square Mile	Particulates	SO_X	NO_X	TSP Counties	SO_X Counties
Cental Minnesota	127	.25	6,215	40	II	III	III	(0)	(0)
Southeast Minnesota - La Crosse (Wisc.)	128	1.11	24,073	46	II	IA	III	(0)	(0)
Duluth-Superior (Wisc.)	129	.49	28,557	17	I	II	III	(1) St. Louis[b] (City of Duluth)	(0)
Metropolitan Fargo - Moorhead (N.D.)	130	.12	2,794	43	II	III	III	(0)	(0)
Minneapolis - St. Paul	131	1.88	2,820	668	I	I	III	(7) Hennepin, Ramsey, Washington, Scott, Carver, Dakota, Anoka	(7) Hennepin, Ramsey, Washington, Scott, Carver, Dakota, Anoka
Northwest Minnesota	132	.40	27,450	15	II	III	III	(0)	(0)
Southwest Minnesota	133	.30	12,011	25	III	III	III	(0)	(0)

[a]As of November 14, 1974

[b]Only the city of Duluth has a proposed AQMA designation for TSP in St. Louis County.

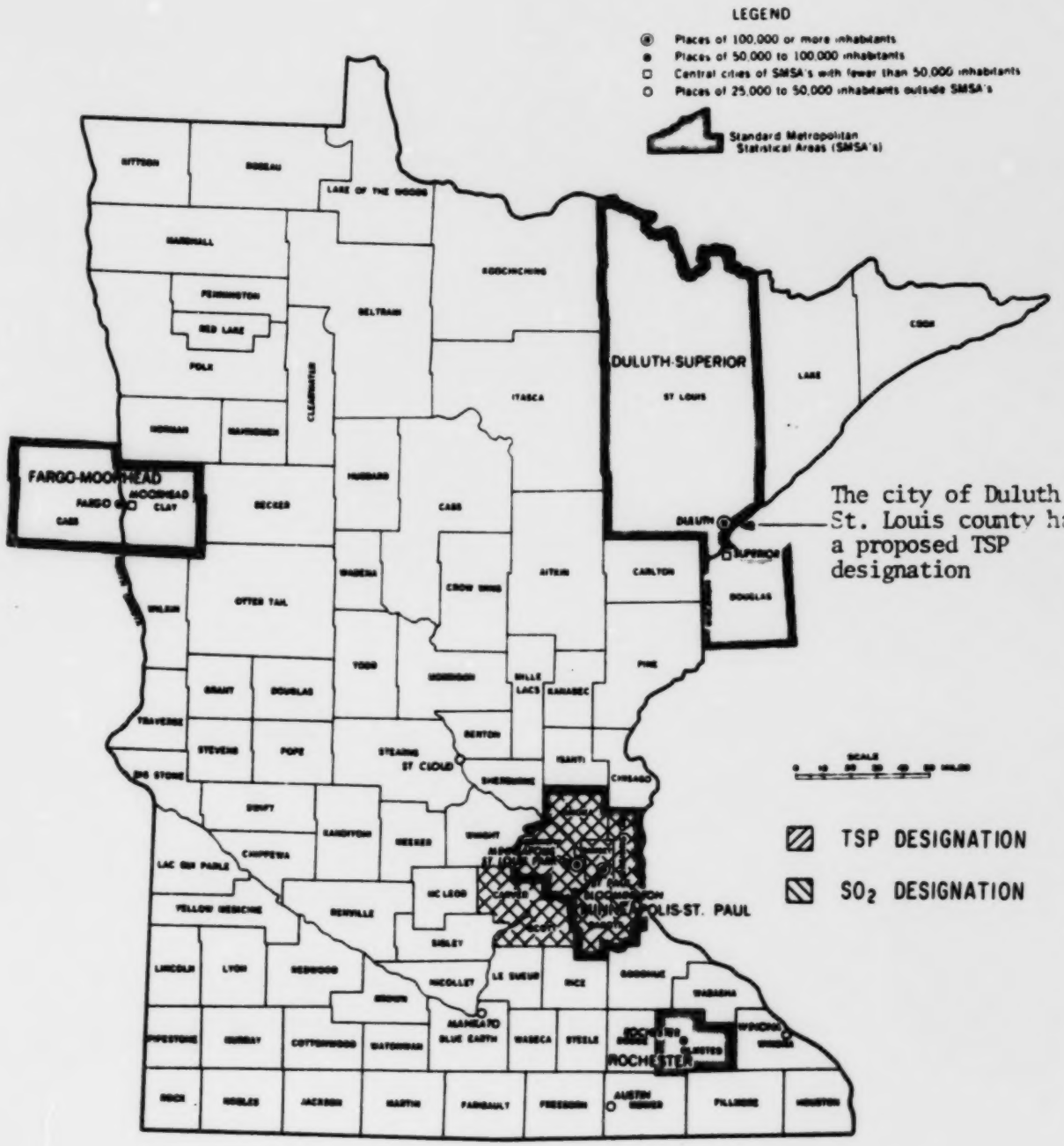
LEGEND
Places of 100,000 or more inhabitants
Places of 50,000 to 100,000 inhabitants
Central cities of SMSA's with fewer than 50,000 inhabitants
Places of 25,000 to 50,000 inhabitants outside SMSA's
Standard Metropolitan Statistical Areas (SMSA's)
DULUTH-SUPERIOR
FARGO-MOORHEAD
The city of Duluth in St. Louis county has a proposed TSP designation
TSP DESIGNATION
SO2 DESIGNATION
MINNEAPOLIS-ST. PAUL
ROCHESTER
ST CLOUD
MANKATO

Figure A-1. Proposed Minnesota Air Quality Maintenance Area (AQMA) Designations

Table A-2. Minnesota Ambient Air Quality Standards

All concentrations in $\mu gm/m^3$

		Total Suspended Particulate		Sulfur Oxides			Nitrogen Dioxide
		Annual	24-Hr	Annual	24-Hr	3-Hr	Annual
Federal	Primary	75(G)	260[a]	80(A)	365[a]	---	100(A)
	Secondary	60(G)	150[a]	---	---	1300[a]	100(A)
State	Primary	75(G)	260[a]	60(A)	260[a]	655[a]	100(A)
	Secondary	60(G)	150[a]	60(A)	260[a]	655[a]	100(A)

[a]Not to be exceeded more than once per year.

(A) Arithmetic mean

(G) Geometric mean

TABLE A-3. Minnesota AQCR Air Quality Status, TSP[a]

AQCR No.	No. Stations Reporting		TSP Concentration ($\mu g/m^3$)			Number of Stations Exceeding Ambient Air Quality Standards				% Reduction Required to Meet Standards	Controlling Standard
			Highest Reading		2nd Highest Reading	Primary		Secondary			
	24-Hr	Annual	Annual	24-Hr	24-Hr	Annual	24-Hr[c]	Annual	24-Hr[c]		
127	8	7	59	221	142	0	0	0	0	- 3	Annual
128[b]	17	11	77	342	228	1	0	3	6	+ 38	24-Hr
129[b]	32	16	81	522	283	3	1	7	15	+ 51	24-Hr
130[b]	7	5	81	503	337	1	3	2	7	+ 59	24-Hr
131	32	23	103	280	260	4	0	11	14	+ 74	Annual
132	5	3	86	618	265	1	1	1	2	+ 47	24-Hr
133	5	3	58	318	237	0	0	0	3	+ 40	24-Hr

[a] 1973 air quality data in National Air Data Bank as of June 7, 1974.

[b] Interstate.

[c] Violations based on 2nd highest reading at any station.

[d] Formula:

$$\text{Maximum of } \left[\left(\frac{\text{2nd Highest 24-Hr} - \text{24-Hr Secondary Standard}}{\text{2nd Highest 24-Hr} - \text{Background}} \right) \times 100 \text{ or } \left(\frac{\text{Annual} - \text{Annual Secondary Standard}}{\text{Annual} - \text{Background}} \right) \times 100 \right]$$

Minnesota particulate background concentration:

AQCR's 127, 130, 132: 20 $\mu g/m^3$
AQCR's 128, 129, 133: 21.4 $\mu g/m^3$
AQCR 131: 45 $\mu g/m^3$

TABLE A-4. Minnesota AQCR Air Quality Status, SO_2[a]

AQCR No.	No. Stations Reporting			SO_2 Concentration ($\mu gm/m^3$)			Number of Stations Exceeding Ambient Air Quality Standards			% Reduction Required to Meet Standards[d]	Controlling Standard
				Highest Reading		2nd Highest Reading	Primary		Secondary		
	Annual	24-Hr	Cont.	Annual	24-Hr	24-Hr	Annual	24-Hr[c]	3-Hr[c]		
127	1	2	0	5	146	73	0	0	-	- 400	24-Hr
129[b]	4	7	1	32	610	151	0	0	0	- 142	24-Hr
129[b]	1	8	1	22	107	49	0	0	0	- 264	Annual
132[b]	0	2	0	-	68	23	-	0	-	- 1,487	24-Hr
131	12	18	9	71	985	985[e]	0	3	1	+ 63	24-Hr
132	0	1	0	-	23	23	-	0	-	- 1,487	24-Hr
133	0	1	0	-	20	20	-	0	-	- 1,725	24-Hr

[a] 1973 air quality data in National Aerometric Data Bank as of June 7, 1974.

[b] Interstate.

[c] Violations based on 2nd highest reading at any station.

[d] Formula:

$$\text{Maximum of } \left[\left(\frac{\text{2nd Highest 24-Hr} - \text{24-Hr Standard}}{\text{2nd Highest 24-Hr}} \right) \times 100 \text{ or } \left(\frac{\text{Annual} - \text{Annual Standard}}{\text{Annual}} \right) \times 100 \right]$$

[e] Actual value of second highest reading not available at station with greatest excesses. Estimate of % reduction required based on highest 24-hour reading.

TABLE A-5. Minnesota Fuel Combustion Source Summary

AQCR No.	Power Plants[a]	Other Fuel Combustion Point Sources[b]	Area Sources[c]	Total Emissions[d] (10^3 tons/year) TSP	SO_2	% Emissions from Minnesota Fuel Combustion Sources TSP	SO_2
127	2	7	9	15	16	93	94
128[e]	14	5	20	129	157	26	29
129[e]	6	4	7	110	137	40	80
130[e]	0	1	1	21	6	29	67
131	6	7	7	43	208	37	90
132	3	7	25	35	16	46	88
133	5	2	13	43	20	35	95
TOTAL	36	33	87	396	560	37	70

[a]Minnesota plants

[b]Minnesota plants contributing 90% of the particulate and SO_2 emissions, or 1,000 or more tons per year.

[c]Minnesota counties

[d]AQCR totals

[e]Interstate

Table A-6. Minnesota Emissions Summary,[a] TSP

AQCR	Total (10^3 tons/yr)	%	Electricity Generation (10^3 tons/yr)	%	Industrial/Commercial/ Institutional Point Source (10^3 tons/yr)	%	Area Source (10^3 tons/yr)	%
127	15	4	1	5	1	6	12	81
128 Minnesota	52	13	4	8	1	2	31	60
Other	77	19	47	61	8	11	15	19
Total	129	32	51	38	9	7	46	36
129 Minnesota	99	25	18	18	19	19	7	7
Other	11	3	2	19	1	14	4	39
Total	110	28	20	18	20	18	11	10
130 Minnesota	7	2	<1	1	4	54	2	25
Other	14	3	<1	0	1	11	1	5
Total	21	5	<1	<1	5	25	3	12
131	43	11	11	27	2	5	3	8
132	35	9	<1	1	10	27	6	16
133	43	11	11	25	<1	<1	4	10
TOTAL	396	100	92	23	47	12	85	22

[a]Emissions in National Emissions Data System data bank as of June 1974.

TABLE A-7. Minnesota Emissions Summary,[a] SO_2

AQCR	Total (10^3 tons/yr)	%	Electricity Generation (10^3 tons/yr)	%	Industrial/Commercial/ Institutional Point Source (10^3 tons/yr)	%	Area Source (10^3 tons/yr)	%
127	16	3	3	17	2	14	10	65
128 Minnesota	47	8	14	30	3	7	28	59
Other	110	20	86	73	8	7	15	13
Total	157	28	100	64	11	7	43	27
129 Minnesota	120	21	29	24	65	54	15	13
Other	17	3	8	49	2	9	5	27
Total	137	24	37	27	67	48	20	15
130 Minnesota	4	1	<1	11	1	19	3	66
Other	2	<1	0	0	1	29	1	60
Total	6	1	<1	7	2	23	4	64
131	208	37	150	72	23	11	14	7
132	16	3	1	7	4	26	9	59
133	20	4	9	45	1	6	9	45
TOTAL	360	100	300	54	110	20	109	20

[a]Emissions in National Emission Data System data bank as of June 1974.

TABLE A-8. Minnesota Required Emissions Reduction[a]

AQCR	Estimated Particulate Emission Reduction Required		Estimated SO_2 Emission Reduction Required	
	%	10^3 tons/year	%	10^3 tons/year
127	- 3	< - 1	- 400[c]	- 64
128[b]	+ 38	+ 49	- 142	- 223
129[b]	+ 51	+ 56	- 264	- 362
130[b]	+ 59	+ 12	- 1,487[c]	- 80
131	+ 74	+ 32	+ 63	+ 131
132	+ 47	+ 16	- 1,487[c]	- 238
133	+ 40	+ 17	- 1,725[c]	- 345

[a]Based on a proportional change of emissions to air quality.

[b]Interstate.

[c]Exceptionally large negative numbers indicate current air quality is very good. In this range, the proportional calculations do not give a good picture of allowable emission increases. They are included here only as general indicators.

Table A-9. Minnesota Fuel Combustion Emission Regulations

SO_x		$\leq 250 \times 10^6$ Btu/hr	$> 250 \times 10^6$ Btu/hr
	Minneapolis-St. Paul (AQCR #131):	2.0% sulfur by weight	1.5% sulfur by weight
	AQCRs other than Minneapolis-St. Paul (AQCR #131):		2.0% sulfur by weight
	These provisions shall not apply under the following conditions: 1. A variance has been granted by the Minnesota Pollution Control Agency 2. The following limitation is met: 1.75 lb $SO_x/10^6$ Btu.		

Particulate Matter	New installations and installations within the Minneapolis-St. Paul AQCR (#131) and the city of Duluth	Existing installations and installations outside the Minneapolis-St. Paul AQCR (#131) and the city of Duluth
	0.4 lb/10^6 Btu[a]	0.6 lb/10^6 Btu[a]
	In addition, emissions from all facilities are subject to the constraints of Figure A-2.[b]	

Visible Air Contaminants	Existing installations including boats and ships except existing incineration	New installations and all incinerators
	No visible emission: a. Darker than Ringelmann No. 3 b. Darker than Ringelmann No. 2 but less than Ringelmann No. 3 for longer than 4 minutes in aggregate in any 60 minutes. c. Darker than Ringelmann No. 1 but less than Ringelmann No. 2 for longer than 4 minutes in aggregate in any 30 minutes	No visible emissions darker than Ringelmann No. 1
	Exception: A person may discharge from any single source for a period not more than 4 minutes in aggregate in any 60 minutes air contaminants not darker than Ringelmann No. 2.	

[a]Maximum allowable emission from any stack, plant, or installation regardless of stack height or number of stacks.

[b]This provision of the regulation was not used in the present analysis.

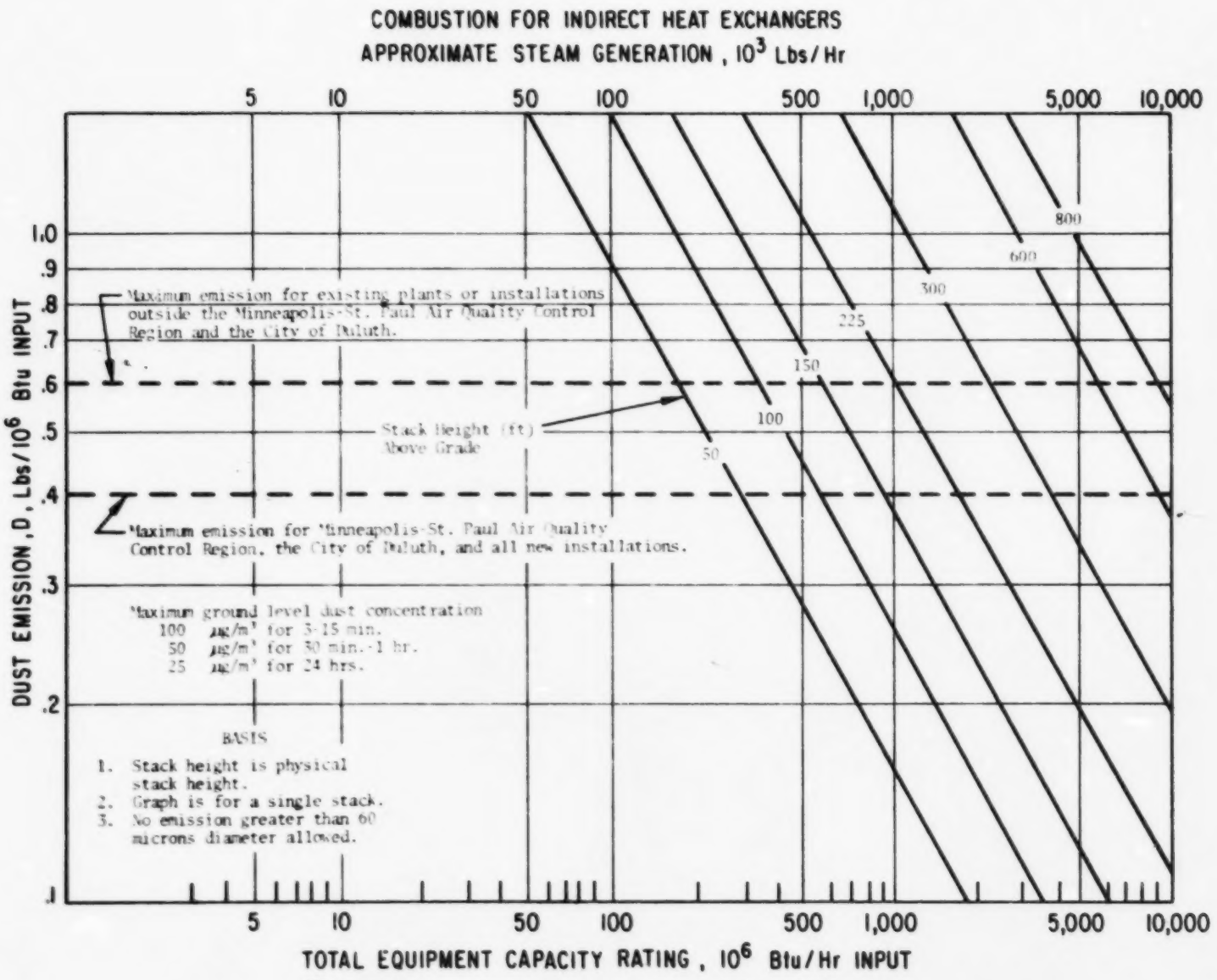

Figure A-2. Graph for Estimating Allowable Emissions
(Adapted from Figure 2 of ASME Standards "APS-1")

APPENDIX B Regional Air Quality Assessment

TABLE B-1. Minnesota AQCR Candidacy Assessment for Particulate Regulation Relaxation

AQCR	Federal Number	Stations with Particulate Air Quality Violations[a]	Expected Attainment Date	Counties with Proposed Particulate AQMA Designations	Total Particulate Emissions (10^3 tons/yr)	% Emissions from Minnesota Fuel Combustion	Estimated Emission Reduction Required for NAAQS (10^3 tons/yr)	Particulate Priority
Central Minnesota	127	0	6	0	15	93	< -1	II
Southeast Minnesota La Crosse[c]	128	6	7/75	0	129	26	+ 49	II
Duluth-Superior[c]	129	16	7/75	1[e]	110	40	+ 56	I
Metropolitan Fargo Moorhead[c]	130	7	7/75	0	21	29	+ 12	II
Minneapolis-St. Paul	131	16	7/75	7	43	37	+ 32	I
Northwest Minnesota	132	2	7/75	0	35	46	+ 16	II
Southwest Minnesota	133	3	d	0	43	35	+ 17	III

[a]Total number of stations given on Table A-3.

[b]Presently meeting standards.

[c]Interstate.

[d]Attainment schedule indicates region is below standards; current data indicates violations.

[e]Only the city of Duluth has a proposed AQMA designation in St. Louis county.

TABLE B-2. Minnesota AQCR Candidacy Assessment for SO_2 Regulation Relaxation

AQCR	Federal Number	Stations with SO_2 Air Quality Violations[a]	Expected Attainment Date	Counties with Proposed SO_2 AQMA Designations	Total SO_2 Emissions (10^3 tons/yr)	% Emissions from Minnesota Fuel Combustion	Estimated Emission Reduction Required for NAAQS (10^3 tons/yr)	SO_2 Priority
Central Minnesota	127	0	b	0	16	94	- 64	III
Southeast Minnesota La Crosse[c]	128	0	b	0	157	29	-223	IA
Duluth-Superior[c]	129	0	b	0	137	80	-362	II
Metropolitan Fargo-Moorhead[c]	130	0[d]	b	0	6	67	- 89	III
Minneapolis-St. Paul	131	3	7/75	7	208	90	+131	I
Northwest Minnesota	132	0[d]	b	0	16	88	-238	II
Southwest Minnesota	133	0[d]	b	0	20	95	-345	III

[a]Total number of stations given on Table A-4.

[b]Presently meeting standards.

[c]Interstate.

[d]No annual data.

APPENDIX C Power Plant Assessment

Table C-1. Minnesota Power Plant Assessment

AQCR	Plant	1975 Capacity (MW)	Estimated 1975 Fuel Use		% S Under SIP Regulation[b]	% S Allowed by Model[c]
			Fuel	Quantity[a]		
127	Whitney	20.0	Coal	11	h	-
			Gas	260	h	-
	Elk River	48.0	Coal	19	h	-
			Coke	22	h	-
			Oil	1428	h	-
			Gas	393	h	-
128[d]	Albert Lea	18.5	Oil	924	h	-
			Gas	258	h	-
	Fox Lake	104.6	Coal	18	2.0	2.1
			Oil	12,264	2.0	-
			Gas	3,198	-	-
	Red Wing	23.0	Coal	39	h	-
			Gas	858	h	-
	Wilmarth	25.0	Coal	26	h	2.0[e]
			Gas	589	h	-
	Winona	17.2	Coal	28	h	2.0[e]
	Austin	27.5	Coal	10	h	-
			Oil	524	h	-
			Gas	863	h	-
	Northeast	32.0	Coal	12	2.0	-
			Oil	610	2.0	-
			Gas	1,004	-	-
	Blue Earth	4.0	Coal	4	h	-
			Gas	69	h	-
	Lincoln Street	26.5	Coal	10	h	-
			Oil	840	h	-
			Gas	828	h	-
	New Ulm	27.0	Coal	22	h	-
			Gas	1,177	h	-
	Owatonna	34.5	Oil	3,528	h	-
			Gas	1,093	h	-
	Silver Lake	98.4	Coal	101	2.0	-
			Gas	1,973	-	-

Table C-1. Minnesota Power Plant Assessment (Contd.)

AQCR	Plant	1975 Capacity (MW)	Estimated 1975 Fuel Use		% S Under SIP Regulation[b]	% S Allowed by Model[c]
			Fuel	Quantity[a]		
128[d] (Contd.)	Sleepy Eye	3.3	Coal	1	h	-
			Oil	714	h	-
			Gas	112	h	-
	Springfield	7.8	Coal	1	h	-
			Oil	378	h	-
			Gas	172	h	-
129[d]	Aurora	116.1	Coal	351	0.9	0.9[g]
			Oil	878	2.0	-
	Clay Boswell	500.0	Coal	1,927	0.9	0.9
			Oil	105	0.3	-
	M. L. Hibbard	122.5	Coal	293	1.4	1.4[g]
			Gas	1,458	-	-
	Hibbing	19.0	Coal	104	h	-
			Gas	88	h	-
	Two Harbors	6.0	Coal	6	h	-
			Gas	131	h	-
	Virginia	32.5	Coal	88	2.0	-
			Gas	156	-	-
130[d]	No Power Plants					
131	Black Dog	486.7	Coal	554	1.5	1.5[g]
			Oil	168	0.3	-
			Gas	13,096	-	-
	High Bridge	463.8	Coal	462	1.5	1.5[g]
			Oil	4,035	0.3	-
			Gas[f]	16,617	-	-
			Gas	655	-	-
	Island	20.0	Gas	71	-	-
	Riverside	455.9	Coal	1,012	1.2	1.2[g]
			Oil	3,199	0.3	-
			Gas	5,700	-	-
	Southeast	30.0	Oil	1,092	0.3	-
			Gas	365	-	-
	A. S. King	598.4	Coal	1,337	1.5	3.1

Table C-1. Minnesota Power Plant Assessment (Contd.)

AQCR	Plant	1975 Capacity (MW)	Estimated 1975 Fuel Use		% S Under SIP Regulation[b]	% S Allowed by Model[c]
			Fuel	Quantity[a]		
132	Crookston	10.0	Lignite	35	h	-
			Gas	52	h	-
	Hoot Lake	136.9	Lignite	673	0.96	-
			Oil	126	0.35	-
	Alexandria	5.3	Coal	2	h	-
			Gas	54	h	-
133	Minnesota Valley	46.0	Coal	88	1.9	-
			Oil	20	0.3	-
			Gas	697	-	-
	Ortonville	15.0	Lignite	101	h	-
	Litchfield	3.0	Coal	1	h	-
			Gas	18	h	-
	Willmar	30.4	Coal	28	h	-
			Gas	286	h	-
	Worthington	16.5	Coal	6	h	-
			Oil	756	h	-
			Gas	353	h	-

[a]Coal quantity is 10^3 tons/yr, oil quantity is 10^3 gal/yr, gas quantity is 10^6 ft^3/yr. Estimates are based on 1971 fuel use patterns plus planned additions. If 1971 fuel use data were unavailable, 1972 data were used.

[b]The maximum allowable % S is assumed to be the 1971 % S unless the regulations require a lower % S.

[c]The maximum allowable % S is assumed to be the 1971 % S unless modeling results show a lower % S is allowed.

[d]Interstate.

[e]Modeling results show that use of even the most stringent regulation applicable in this AQCR (i.e. 2.0 % S fuel) would result in NAAQS violation.

[f]Manufactured Gas

[g]Modeling calculations indicate that the 24-hour primary air quality standard may be exceeded even at SIP.

[h]In AQCR's other than Minneapolis - St. Paul (AQCR #131) the sulfur content of fuels for installations of less than 250 x 10^6 Btu/hr is unregulated.

[i]This plant has been identified by the FEA as having the capability to switch from oil to coal as its primary fuel.

Table C-2. Minnesota Power Plant Evaluation Summary

AQCR	Fuel	1975 Fuel Required by SIP Regulations[a] < 1% S	1-2% S	> 2% S	1975 Fuel Required by Modified Regulations[b] < 1% S	1-2% S	> 2% S
127	Coal			30	No modeling results available		
	Coke			22			
	Oil			1,428			
	Gas	653					
128[c]	Coal		131	141		54[d,h]	18[d]
	Oil		12,874	6,908			
	Gas	12,194					
129[c]	Coal	2,278	381	110	2,278[e,g]	293[e,g]	
	Oil	105	878				
	Gas	1,833					
130[c]		No power plants					
131	Coal		3,365			2,028[g]	1,337
	Oil	8,494					
	Gas	36,504					
132	Coal			2	No modeling results available		
	Lignite	673		35			
	Oil	126					
	Gas	106					
133	Coal		88	35	No modeling results available		
	Lignite			101			
	Oil	20		756			
	Gas	1354					
Minnesota Total	Coal	2,278	3,965	318	2,278	2,375	1,355
	Coke			22			
	Lignite	673		136			
	Oil	8,745	13,752	9,092			
	Gas	52,644					

[a]Fuel requirements based on 1971 fuel use patterns at 1975 consumption rates plus any new units. If 1971 fuel use data were unavailable, 1972 data were used. Coal in 10^3 tons/yr, oil in 10^3 gal/yr, gas in 10^6 ft^3/yr. Maximum % S is 1971 % S unless regulations require a lower % S.

[b]Maximum allowable % S is 1971 % S unless modeling indicates a lower value. Modeling did not treat oil.

[c]Interstate.

[d]Modeling results available for only 3 of the 14 power plants in this AQCR.

[e]Modeling results available for 3 of the 6 power plants in this AQCR.

[f]Modeling results available for 4 of the 6 power plants in this AQCR. However, for the 2 power plants which were not modeled it is estimated that only oil and gas will be used for fuels.

[g]Modeling calculations indicate that the 24-hour primary air quality standard may be exceeded even at SIP.

[h]Modeling results show that use of even the most stringent regulation applicable in this AQCR (i.e. 2.0% S fuel) would result in NAAQS violation.

APPENDIX D Industrial, Commercial, Institutional Point Source Assessment

Table D-1. Minnesota Industrial/Commercial/Institutional Source Assessment

AQCR	Plant[a]	Fuel[b]	Estimated Fuel Consumption[c]	SIP Regulations % S[d]
127	Cambridge State Hospital	Coal	3	-
		Oil	183	-
	St. Regis Paper Co (Plant 2)	Coal	29	-
		Gas	313	-
	Kraft Foods	Oil	548	-
	St. Benedict's College	Oil	500	-
		Gas	41	-
	St. John's University	Coal	32	-
	Burlington Northern, Inc	Oil	852	-
	St. Regis Paper Co (Plant 11)	Coal	20	-
128[d]	Wilson Sinclair Co	Coal	22	-
		Oil	79	-
		Gas	413	-
	PPG Industries	Coal	6	-
	Hormel and Co	Oil	4,690	-
		Gas	969	-
	Archer Daniels	Coal	7	-
		Oil[e]	8	-
	Honeymead Products Co	Oil	1,680	-
		Gas	1,280	-
129[d]	Northwest Paper Co	Coal	212	2.0
		Oil	1,184	2.0
		Gas	2,370	-
	Conwed Corp	Coal	17	-
	Erie Mining Co	Coal	531	2.0
	Boise Cascade	Coal	82	-
		Oil	480	-
		Gas	7	-
130[d]	American Crystal Sugar Co	Lignite	81	-

Table D-1. Minnesota Industrial/Commercial/Institutional Source Assessment (Cont.)

AQCR	Plant[a]	Fuel[b]	Estimated Fuel Consumption[c]	SIP Regulations % S[d]
131	Koch Refining Co	Oil	11,790	2.0
	Northwest Refining Co (Plant 12)	Oil	6,250	2.0
		Gas	42	-
	University of Minnesota	Coal	37	2.0
		Oil	800	2.0
	B. F. Nelson	Coal	5	2.0
		Oil	153	2.0
		Gas	221	-
	Hoerner Waldorf Corp	Oil	9,200	1.7
		Gas	2,760	-
	3M Company	Coal	28	2.0
	Northwest Refining (Plant 3)	Oil	4,779	1.7
		Gas	3,889	-
132	Burlington Northern	Coal	21	-
	NW Paper Co, Potlatch Forest, Inc	Coal	29	-
		Gas	623	-
	Hennepin Paper	Oil	1,150	-
	Fergus Falls State Hospital	Lignite	12	-
		Coal	4	-
	American Crystal Sugar Co (Plant 1)	Lignite	78	-
	American Crystal Sugar Co (Plant 2)	Lignite	73	-
	King of Spuds, Inc	Lignite	90	-

Table D-1. Minnesota Industrial/Commercial/Institutional Source Assessment (Cont.)

AQCR	Plant[a]	Fuel[b]	Estimated Fuel Consumption[c]	SIP Regulations % S[d]
133	Wilmar State Hospital	Oil	2,740	-
	1st District Assoc	Oil	150	-
		Gas	1,050	-

[a]Minnesota plants contributing 90% of AQCR's SO_2 or emitting more than 1000 tons/yr of SO^2.

[b]Does not include plant or process gas. Oil is residual unless otherwise specified.

[c]Coal in 10^3 tons/yr, oil in 10^3 gal/yr, gas in 10^6 ft^3/yr.

[d]Interstate.

[e]Distillate Oil.

Table D-2. Minnesota Industrial/Commercial/Institutional Source Evaluation Summary

AQCR	Fuel[a]	Fuel Required by Existing Regulations[b]		
		< 1% S	1-2% S	> 2% S
127	Coal			84
	Oil			2,083
	Gas	354		
128[d]	Coal			35
	Oil			6,449
	Oil[c]			8
	Gas	2,662		
129[d]	Coal		743	99
	Oil		1,184	480
	Gas	2,377		
130[d]	Lignite			81
131	Coal		70	
	Oil		32,972	
	Gas	6,912		
132	Coal			54
	Lignite			253
	Oil			1,150
	Gas	623		
133	Oil			2,890
	Gas	1,050		
Minnesota Total	Coal		813	272
	Lignite			334
	Oil		34,156	13,060
	Gas	13,978		

[a]Oil is residual unless otherwise specified.

[b]Does not include plant or process gas. Coal in 10^3 tons/yr, Oil in 10^3 gal/yr, gas in 10^6 ft^3/yr.

[c]Distillate Oil

[d]Interstate.

APPENDIX E

Area Source Assessment

TABLE E-1. Minnesota Area Source Fuel Use

AQCR	Coal (10^3 tons/yr)	Residual Oil (10^3 gals/yr)	Distillate Oil (10^3 gals/yr)	Natural Gas (10^6 ft^3/yr)
127	3	6,800	63,410	12,220
128[a]	215	22,630	244,460	87,050
129[a]	150	28,800	146,030	74,920
130[a]	18	4,440	41,030	5,300
131	36	108,450	258,800	96,360
132	10	5,910	129,460	8,850
133	7	5,750	91,820	16,060
TOTAL	439	182,780	975,010	300,760

[a]Interstate - Fuel use figures are for entire AQCR.

APPENDIX F Fuels Assessment

Table F-1. Minnesota Clean Fuels Analysis Summary

AQCR	Fuel	Existing Regulations Clean Fuel Requirements[a]		Minimum Clean Fuel Saving Through Regulation Modification[b]	
		< 1% S	1-2 % S	< 1% S	1-2% S
127	Coal			No modeling results	
128[c]	Coal		131	-	-36[d]
129[c]	Coal	2,278	1,124	-	-
130[c]	Lignite			No modeling results	
131	Coal		3,435	-	1,337
132	Coal Lignite	673		No modeling results	
133	Coal Lignite		88	No modeling results	
Minnesota Total	Coal Lignite	2,278 673	4,778	-	1,301

[a]Includes fuel use from power plant (Table C-1) and industrial/commercial/institutional point source (Table D-1) only. Coal in 10^3 tons/yr, oil in 10^3 gal/yr, gas in 10^6 ft^3/yr.

[b]Based on modeling results for power plants only.

[c]Interstate.

[d]Regulation modification would require increased use of this low sulfur fuel.

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